MONITORING PLAN

PROJECT NO. PO-17 BAYOU LA BRANCHE

ORIGINAL DATE: May 16, 1994
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was reduced in scope due to budgetary constraints. Specifically, one post-construction aerial photography will be dropped; continuous water level monitoring will occur for only 5 years; monthly staff gauge readings will be dropped; and the number of vegetation sampling stations will be reduced by 50%.

Project Description

The Bayou La Branche Wetland project (PO-17) encompasses a 436 ac (176 ha) area located in St. Charles Parish on the southwestern shore of Lake Pontchartrain (figure 1). Historically, this area was classified as a brackish marsh (Chabreck and Linscombe 1968) that served as a nursery ground for commercial and recreational finfish species (Hinchee 1977; Cramer 1978). A failed attempt at agriculture in the early 1900s caused subsidence of the interior marsh, which led to the formation of a large open-water pond. The pond has progressively increased in size, leaving just a narrow band of marsh on the Lake Pontchartrain shoreline. Lake Pontchartrain shoreline retreat between 1955 and 1972 was estimated to be 9.5 ft/yr (2.9 m/yr) (Coastal Environments, Inc. 1984), threatening to breach the shoreline and expose the pond to damage from greater wave energy.

The purpose of this project is to create new vegetated wetlands in the open-water pond area of the Bayou La Branche wetlands utilizing dredged sediment. The specific measurable project goals are to create approximately 305 ac (123 ha) of shallow-water habitat conducive to the natural succession of emergent wetland vegetation and to establish a ratio in the project area of 70% emergent marsh and 30% open-water within 5 yr following project completion.

Project components include an earthen containment berm surrounding the pond area and approximately 2.7 million yds^3 (2.1 million m^3) of sediment dredged from the nearby Lake Pontchartrain water bottom. The project is divided into two areas: Pond A and Pond B (figure 1). The barrier between the ponds consists of a spoil ridge with a sheet pile z-wall closure and a concrete weir (weir 1, figure 1). The removal of several segments of the z-wall and the opening of the weir has allowed for the exchange of water between Pond A and Pond B. Exterior weirs (weirs 2 and 3, figure 1) on the eastern berm of Pond B allow excess water to flow out of the project area, and provide for ingress and egress of marine species during periods of high water.

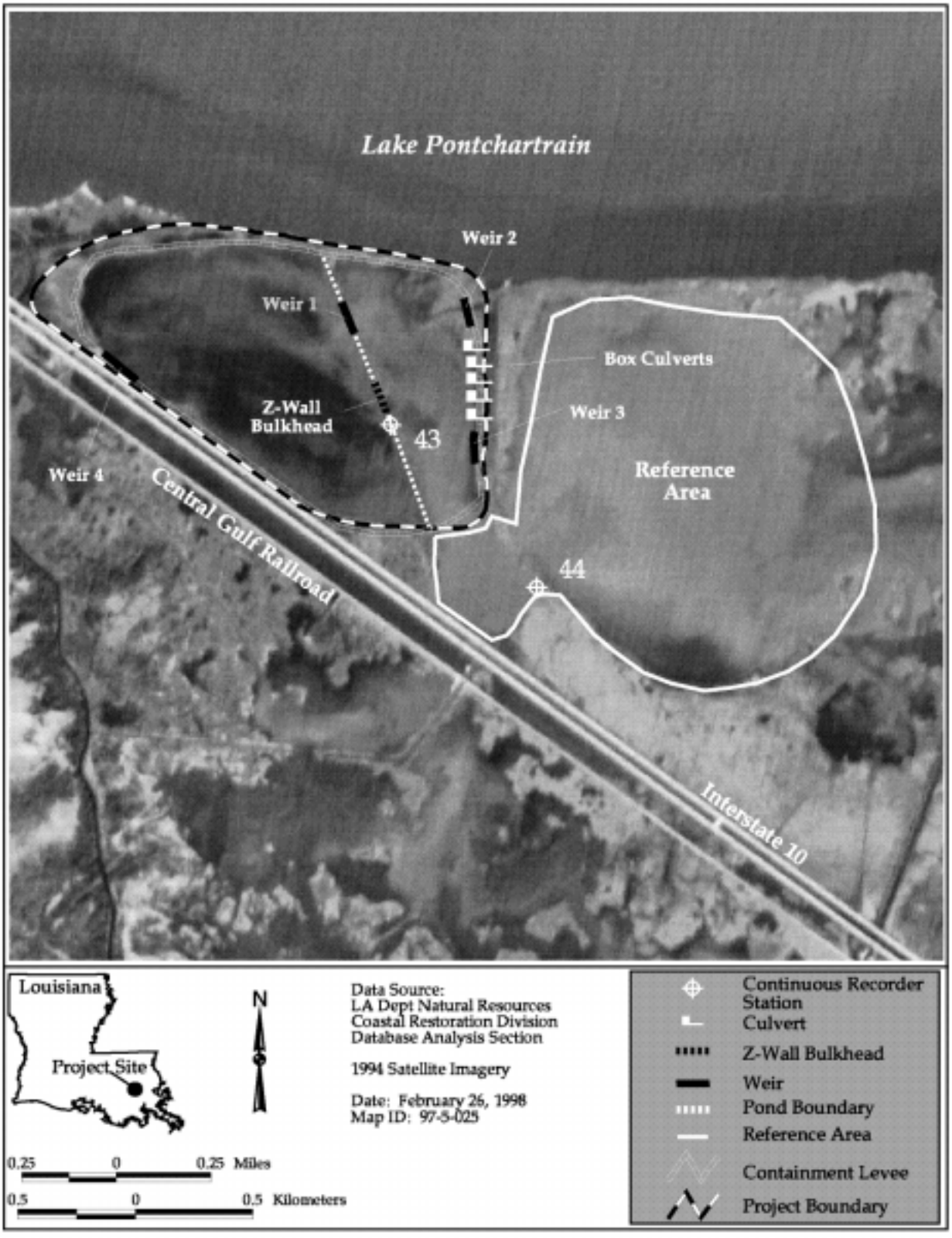

Figure 1. Bayou LaBranche Wetland Restoration (PO-17) project features.

The sediment was pumped from Lake Pontchartrain into the project area between February and April of 1994. In July 1994, the dredged material was aerially seeded with *Echinochloa crusgalli* var. *frumentacea* (Japanese millet) to enhance volunteer plant growth and reduce aeolian transport of sediment. Sediments are expected to consolidate to an elevation of 0.65–1.62 ft (0.2 - 0.5 m) NAVD 5 yr after construction (Cottone 1996). Once the sediment has consolidated completely, *Taxodium distichum* (bald cypress) and undetermined brackish marsh plant species will be planted.

Project Objective

1. Create new vegetated wetlands in the Bayou La Branche area utilizing dredged sediments.

Specific Goals

The following goals will contribute to the evaluation of the above objective:

1. Create approximately 305 ac (123 ha) of shallow water habitat conducive to the natural establishment of emergent wetland vegetation.

2. Increase marsh:open water ratio in the project area to a minimum of 70% marsh to 30% water after five years.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1.	Habitat Mapping	To measure marsh to open water ratios to document marsh loss rate for the project and adjacent reference area, color infrared aerial photography (1:12,000 scale, with ground controls) will be obtained. The photography will be georectified, photointerpreted, mapped and analyzed with GIS by National Wetland Research Center (NWRC) personnel using procedures outlined in Steyer et al. 1995). The photography will be flown in 1993 (pre-construction), and in 1997, and 2012.
2.	Vegetation	Will be conducted to quantify species composition and relative abundance of emergent vegetation in duplicate one square meter plots taken at 880 ft (268 m) intervals along the vegetative transects for a total of 42 plots. Sampling will be conducted during periods of peak vegetation biomass. Vegetation will be monitored in pre-construction (1994) and following project completion in 1996, 1997, 1998, 2001, 2004, 2007, 2010, and 2012.

3. Sediment and Water Elevations — Will be measured using 19 staff gauges located at the intersections of vegetation transects to be tied into two continuous recorders located in the project and reference areas. The recorder in the project area will be compared to the reference area recorder in order to determine duration and frequency of flooding. The continuous recorders will collect data from 1994 until 1999. The 19 staff gauges will be monitored monthly from May 1996 until April 1998 and then re-measured during the vegetation sampling periods.

4. Sediment — Will be collected using a "Swenson" corer, taking one 10 cm deep sample at 880 ft (268 m) intervals along the vegetive transects. Sampling will correspond to the vegetation monitoring in years 1994, 1996, 1997, 1998, 2001, 2004, 2007, 2010, and 2012. Soil variables measured will include percent organic matter, bulk density, soil salinity and water content.

Anticipated Statistical Tests and Hypotheses

The following paragraphs describe statistical tests that will be used to analyze data collected for each monitoring element to evaluate the accomplishment of the project goals. The numbers to the left correspond to the monitoring elements described above. These are followed by statements of the project goals, and the hypotheses that will be used in the evaluation.

1. The land area values taken post-project construction will be modeled using a 'First order autoregressive (FOA) time series model.' Descriptive and summary statistics on historical data (for 1956, 1978, and 1988) and data from color-infrared aerial photography collected pre- and post-construction will be used, along with GIS interpretations of these data sets, to evaluate marsh to open water ratios and changes in the rate of marsh loss/gain in the project and reference areas.

   Goal: Increase marsh:open water ratio in the project area to a minimum of 70% marsh to 30% water after five years.

   Hypothesis:

   H_0: Emergent wetland vegetation area, five years following project implementation will not be equal to or greater than 70% marsh / 30% open water which, for the 436 ac (176 ha) total project area, is equal to 305 ac (123 ha).

H_a: Emergent wetland vegetation area, five years following project implementation will be equal to or greater than 70% marsh / 30% open water which, for the 436 ac (176 ha) total project area, is equal to 305 ac (123 ha).

2. The method of analysis will be based on the type of project:

A. If the project consists of vegetative planting, the data will be evaluated through paired *t*-tests. Analyses will include data such as percent survival and measure of growth (*i.e.* height, spread).

B. If the project does not involve vegetative planting (*i.e.* vegetative transects or vegetative stations), the primary approach will be to determine differences in species composition and relative abundance, as evaluated by an ANOVA that will consider both spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station/transect locations, proximity to structures, and seasonal fluctuations. Ancillary data (*i.e.* herbivory, historical) will be used when available. This additional information may be evaluated through analyses such as: correlation, trend, multiple comparisons, and interval estimation.

Goal: Increase occurrence of emergent wetland vegetation.

Hypothesis:

H_0: Occurrence of emergent wetland vegetation will not be significantly greater after project implementation than occurrence of emergent wetland vegetation before project implementation.

H_a: Occurrence of emergent wetland vegetation will be significantly greater after project implementation than occurrence of emergent wetland vegetation before project implementation.

3. The primary method will be to determine differences in water levels as evaluated by an ANOVA that will consider both spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station locations, proximity to structures, and seasonal fluctuations. Water level and elevation data will be used to determine flooding duration and frequency in order to evaluate effects on emergent wetland vegetation. Ancillary data (*i.e.* precipitation, historical) will be used when available. This additional information may be evaluated through analyses such as: correlation, trend, multiple comparisons, and interval estimation.

Goal: Decrease mean water level in project area.

Hypothesis:

H_0: After construction, water levels within the project area will not be significantly lower than water levels before construction.

H_a: After construction, water levels within the project area will be significantly lower than water levels before construction.

NOTE: Available ecological data, including both descriptive and quantitative data, will be evaluated in concert with the statistical analyses to aid in determination of the overall project success. This includes ancillary data collected in this monitoring project but not used directly in statistical analyses, as well as data available from other sources (USACE, USFWS, DNR, LSU, etc.).

The Wetland Value Assessment (WVA) analysis was used to provide an initial value for hypothesis testing in the absence of more quantitative data.

Notes

1.	Implementation:	Start Construction:	November 2, 1993
		End Construction:	April 17, 1994
2.	COE Point of Contact:	Mike Saucier	(504) 862-2525
3.	DNR Project Manager:	Van Cook	(504) 342-5330
	DNR Monitoring Manager:	John Troutman	(504) 342-1952
	DNR DAS Assistant:	Brian Zielinski	(504) 342-4123

4. The twenty year monitoring plan development and implementation budget for this project is $274,024. Progress reports will be available in August 1995, May 1996, October 1996, April 1997, and April 1999, and comprehensive reports will be available in April 1998, April 2002, April 2005, April 2008, April 2011, and April 2014. These reports will describe the status and effectiveness of the project.

5. Due to logistical problems accessing the project site, the schedule for monitoring has been altered so that the first vegetative and sediment monitoring will be done when the sediment has consolidated sufficiently to allow access. The subsequent monitoring schedule will be as written. The TAG have been made aware of these changes and supports the modification.

6. References:

Chabreck, R. H., and J. Linscombe 1968. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

Coastal Environments Inc. 1984. Environmental Characteristics of the Pontchartrain-Maurepas Basin and Identification of Management Issues: An Atlas. Baton Rouge: Louisiana Department of Natural Resources, Coastal Management Division.

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Cramer, G. W. 1978. A nutrient study in the St. Charles Parish wetlands adjacent to Lake Pontchartrain, Louisiana. M.S. thesis. Baton Rouge: Louisiana State University. 69 pp.

Hinchee, R. E. 1977. Selected aspects of the biology of Lake Pontchartrain, Louisiana. 1. Simulations of man's effects on the Lake Pontchartrain food web. 2. The role of the St. Charles Parish marsh in the life cycle of the gulf menhaden. 3. The fishery value of the St. Charles Parish marsh. M.S. thesis. Baton Rouge: Louisiana State University. 75 pp.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swensen 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.